

Texas Technology Showcase

Energy-Efficient Process Technologies and Best Practices

Chemical and Refining Industries

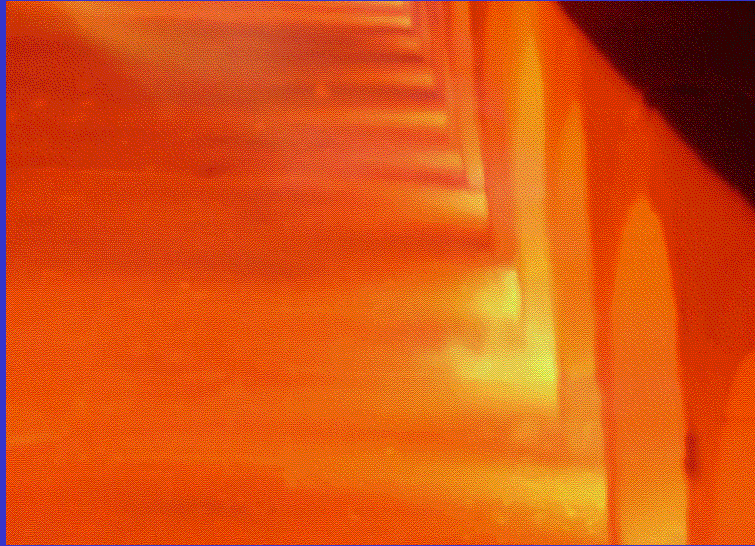
March 17 - 19, 2003 Houston, Texas



Ultra-Low NO_x COOLfuel Burners Eliminate SCRs for Boilers

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Jim Seebold, ChevronTexaco (Ret)**

**What we would
LIKE to do!**



**What we would
like NOT to do!**

Why we don't like SCRs too much ...

It's only money!



... but when we *HAVE* to go for SCR,

BIGGER is BETTER!



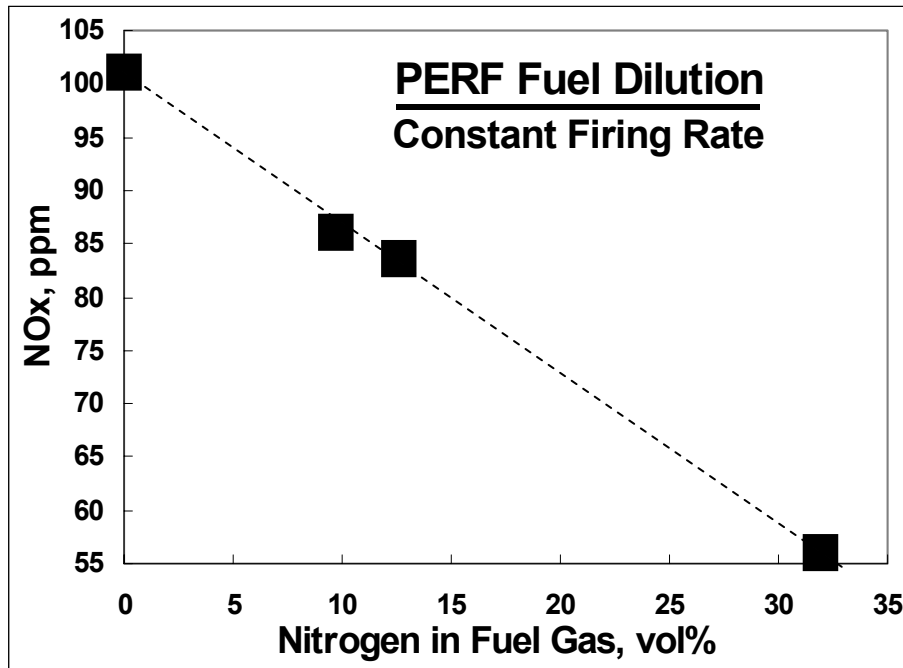
Chevron Richmond Boiler House

Note hills that would have been
the central duct supports
for two monster SCRs ...



Poor Man's SCR: Fuel Conditioning!

“Fuel Induced Recirculation” (FIR) or “Fuel Dilution”



- Reaction rate limited!
- Reduce flame temperature, reduce NOx!
- “Cool” Fuel!
- Ain’t science wunaful?

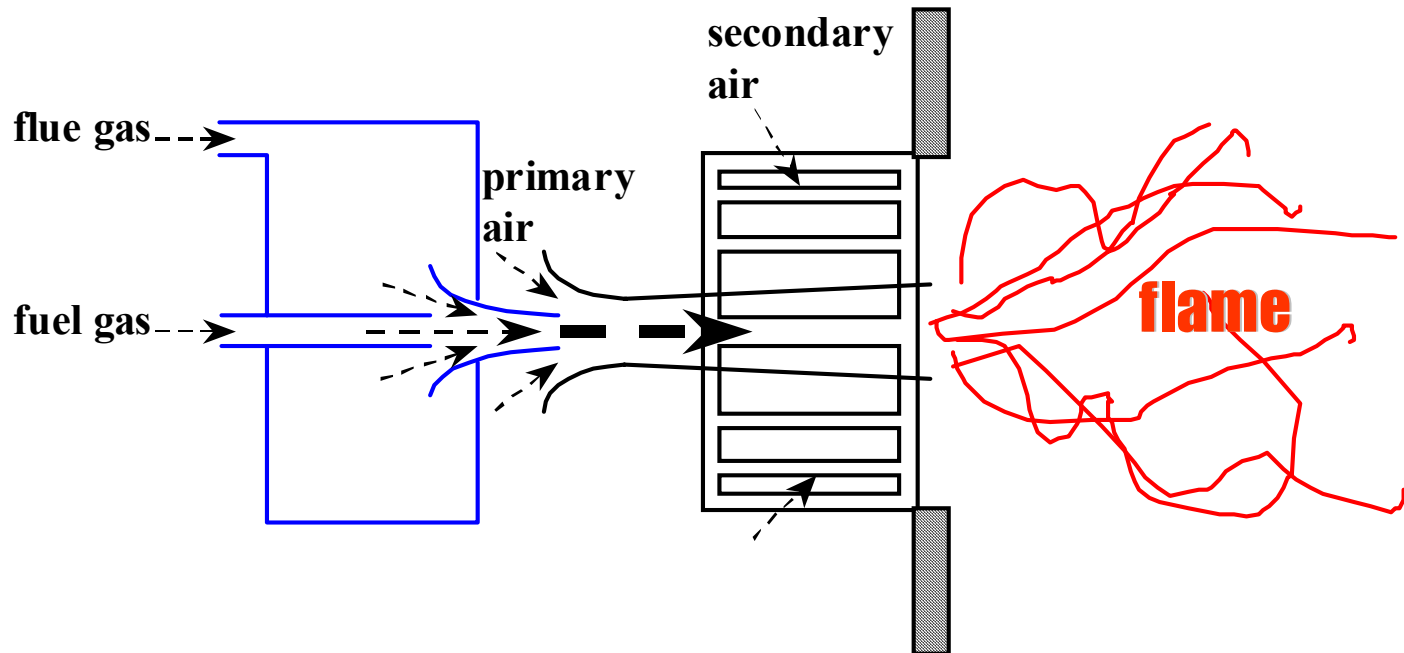
The BIG Idea:

“Deep penetration into the low-Btu regime
... while still maintaining flame stability!”



It's all about making a low-Btu fuel

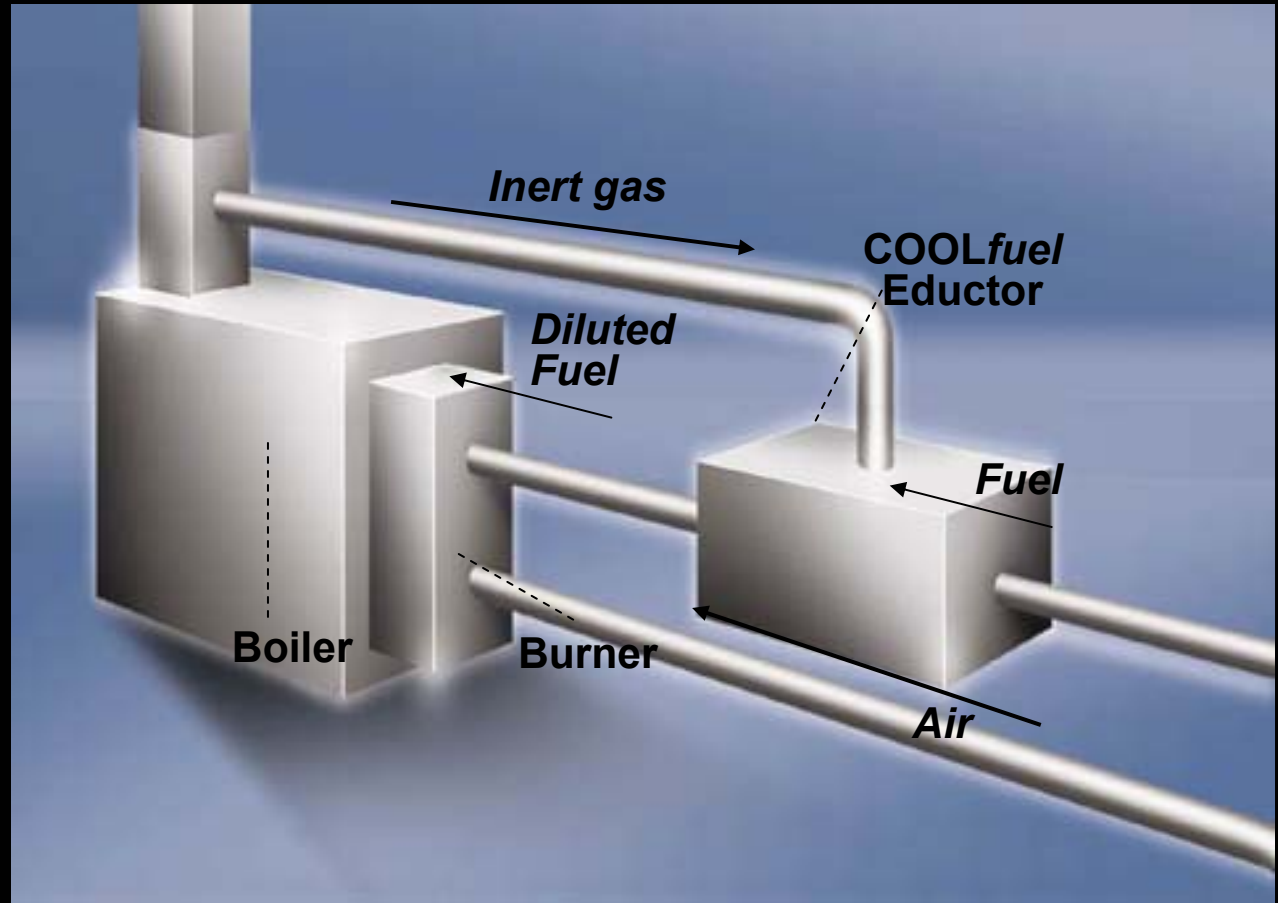
Premixed “FIR” (Fuel Induced Recirculation) Example



COOLfuel

Gas Conditioning

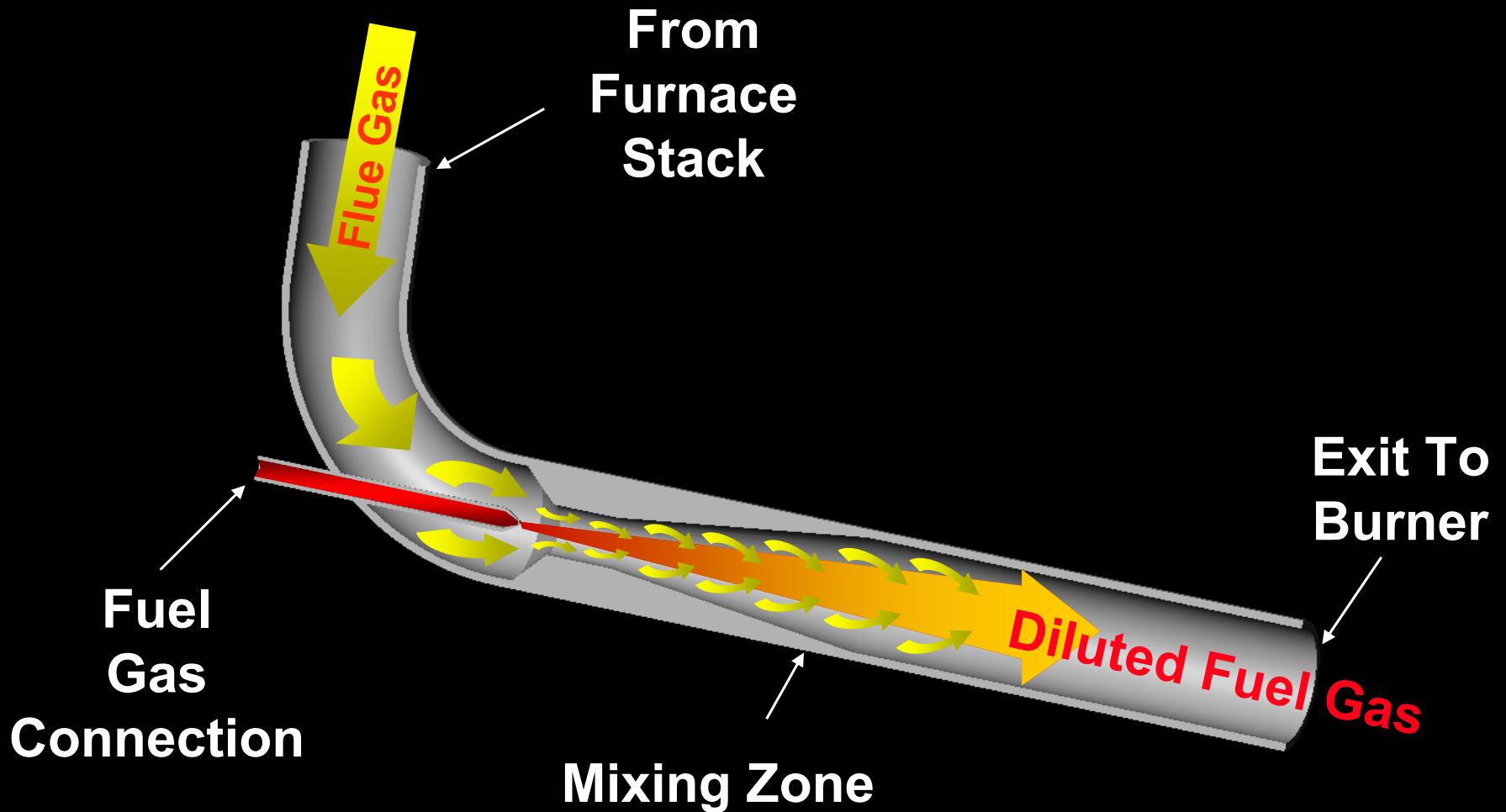
- **Fuel Dilution**
 - Introduction of flue gases into the fuel
 - Lowers the heating value of the fuel
 - The diluted fuel results in lower NO_x
- **Steam Injection**
 - Serves as an additional diluent
 - Induces additional amounts of flue gas



COOL*fuel* method of FIR



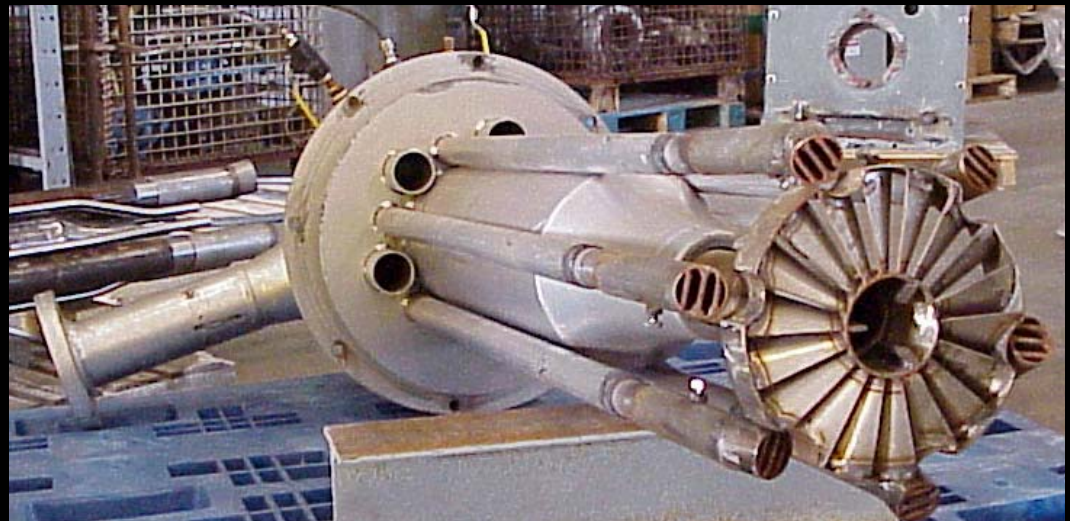
* Patented by John Zink Company *



COOLkits

Low NOx Burner Modifications

- Custom designed components for installation into existing air registers





SCR Performance @ Burner Cost! Richmond Boiler House

- **Treatment:** FIR burner retrofit
- **Cost:** ~\$13-million
 - Saved ~\$7-million by avoiding SCR!
- **Reduction:** 550 tons/year
- **Cost-Effectiveness:** \$4727/ton



SCR Performance @ Burner Cost/ Richmond Boiler House

- **Emission Rate:** 0.03 lb/mmBtu

***But what if we still had to add an
SCR to get below 0.01 lb/mmBtu?***

- **SCR Cost:** \$20-million
- **Reduction:** 38 tons/yr (total 588 tons/yr)
- **Cost-Effectiveness:** \$11,224/ton (total)

 **Marginal Cost:** \$105,263/ton!

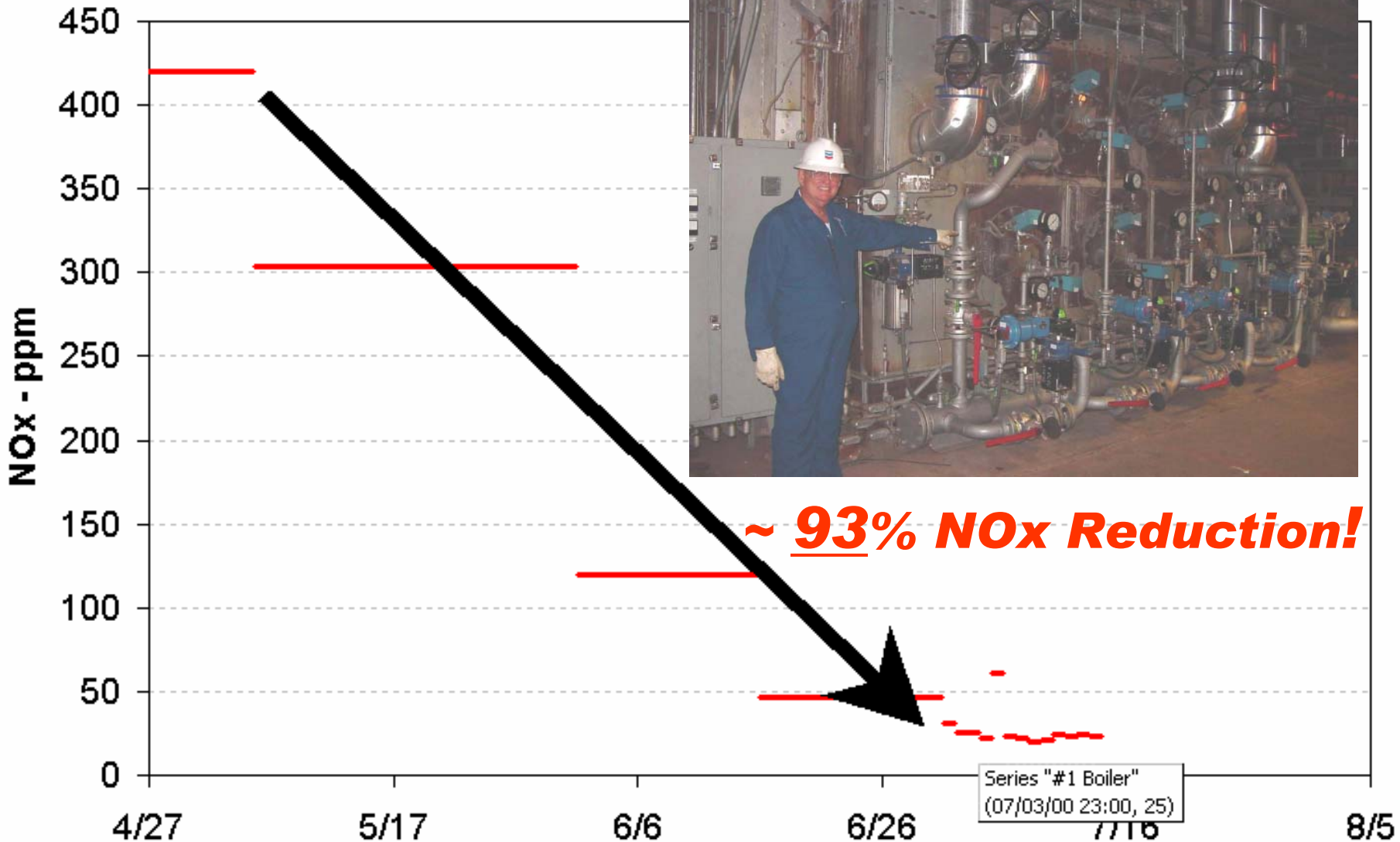


\$105,263/ton

**That's
bad business,
folks!**

Full Screen [X]
Close Full Screen

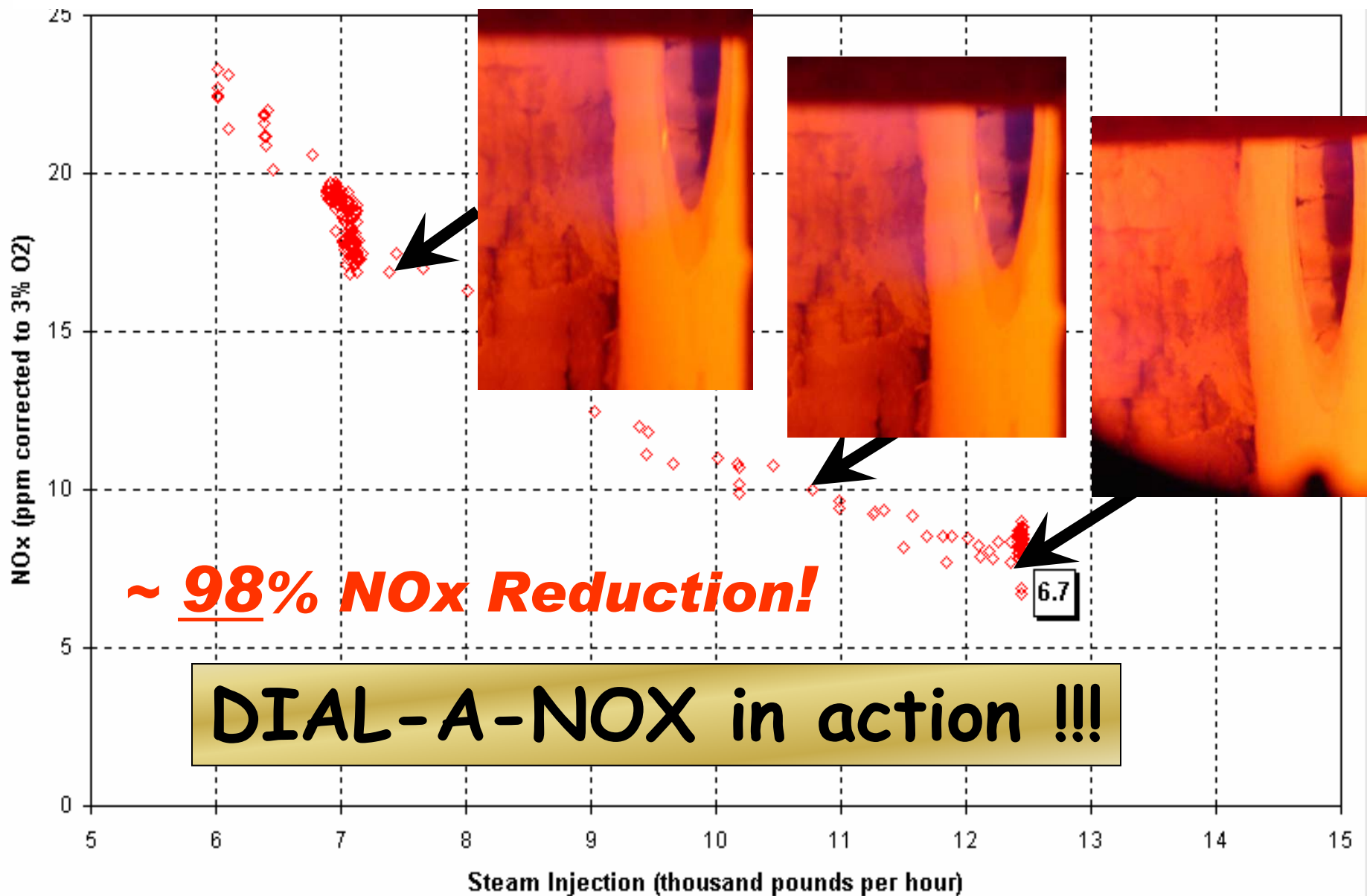
BOILER #4 CEMS DATA - NOX CORRECTED TO 3% O2





***SUB
10!***

#4 Boiler Sub-10 ppm Demonstration







CAUTION



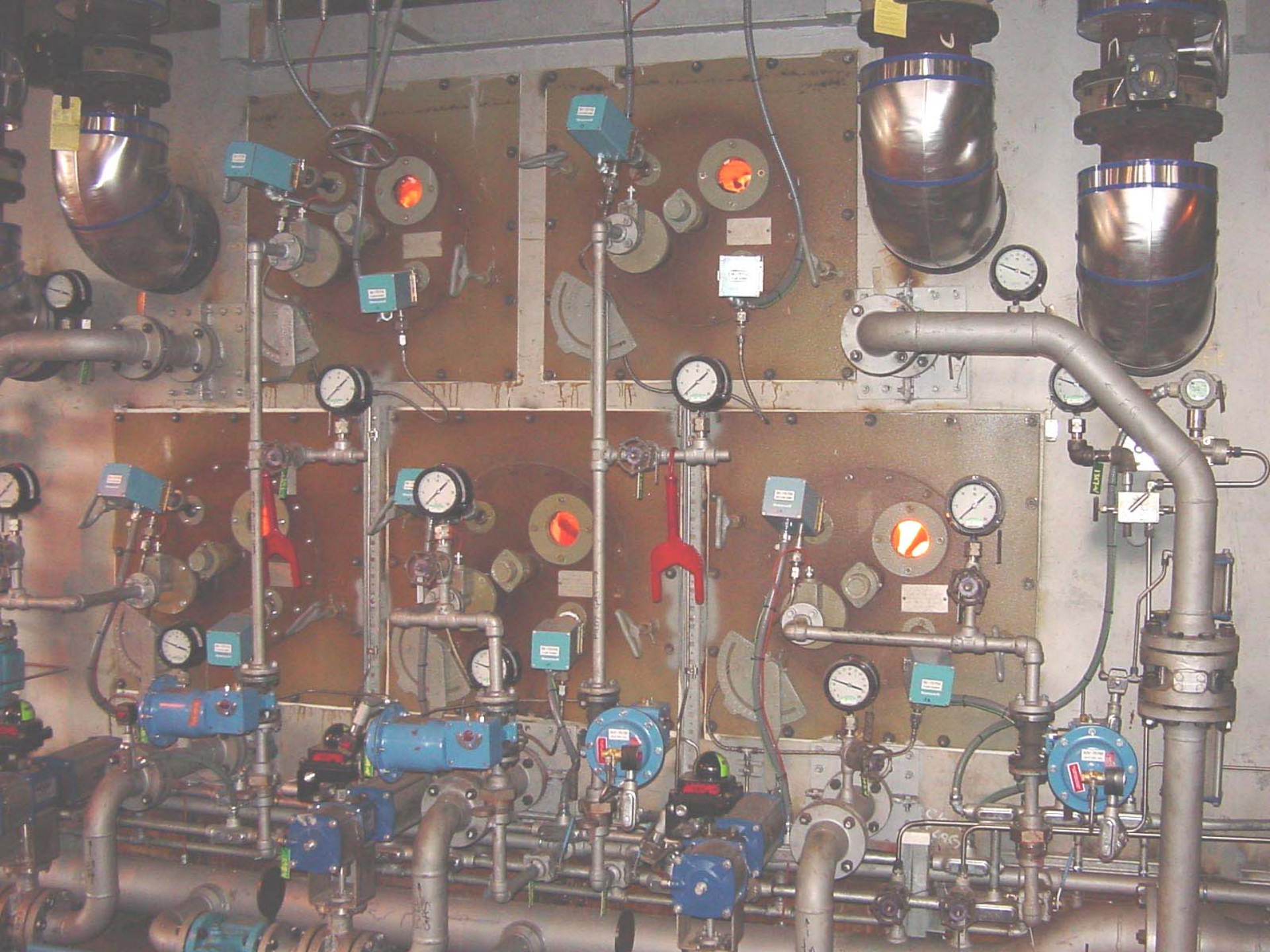
GAS TEST LOCATION

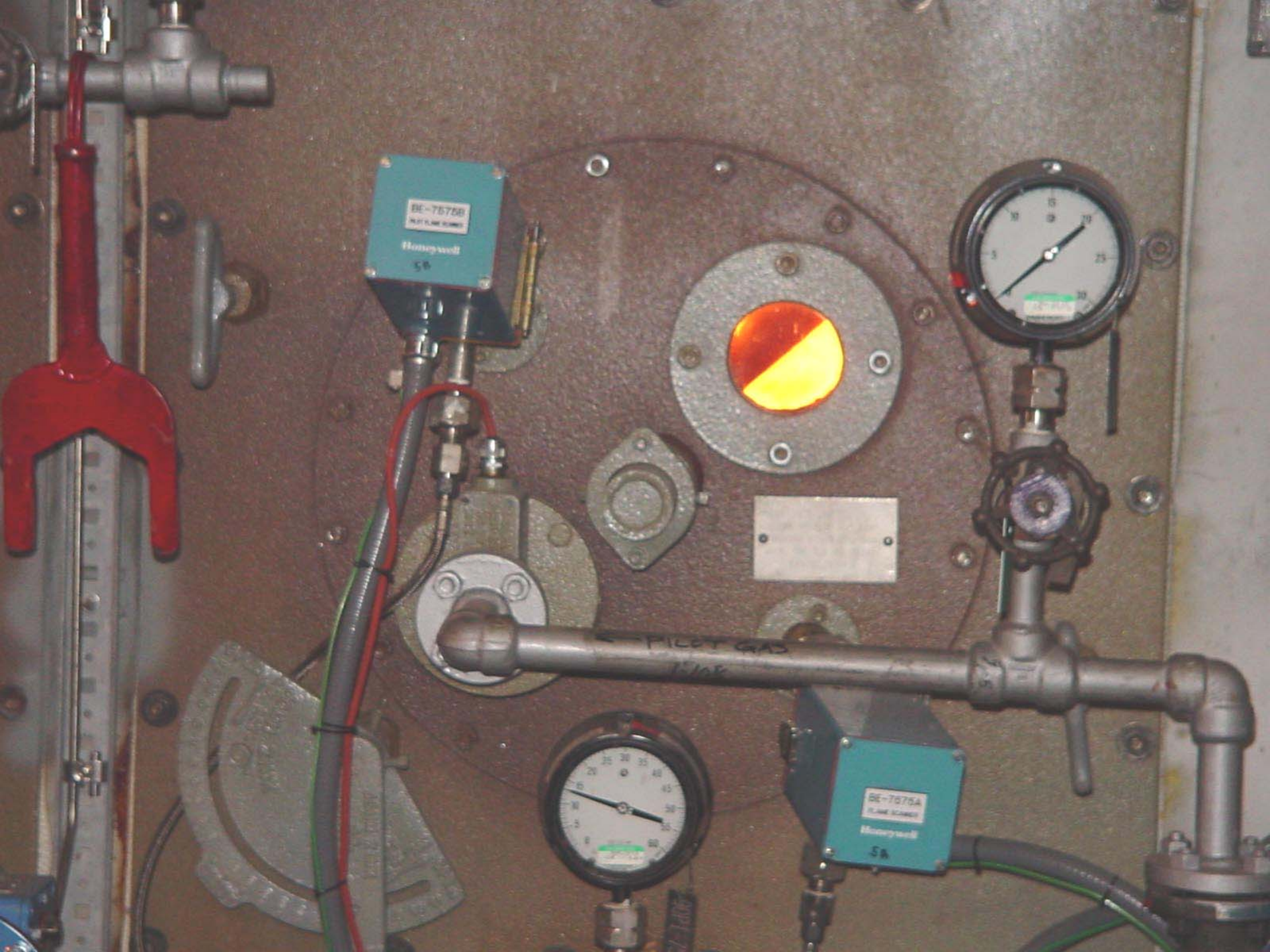
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A tropical sunset scene with palm trees and a hammock. The sun is low on the horizon, casting a warm glow over the water and sky. The sky is filled with soft, white clouds. The palm trees are silhouetted against the bright sky. A hammock is strung between two palm trees, and a person is lying in it, looking out at the ocean. The overall mood is peaceful and relaxing.

Questions?